

# **BIO-DIVERSITY STUDY IN KULDIHA WILDLIFE SANCTUARY**

**REPORT CARD 2010-2015**



**TRAINING & DEVELOPMENT CIRCLE, CUTTACK  
PRINCIPAL CHIEF CONSERVATOR OF FORESTS, ODISHA**





*Cervus unicolor* (Sambar)



*Viverricula indica* (Saliapatini)



## INTRODUCTION :

Today's scenario of climate change, desertification, drought and other natural calamities induced by the destruction of natural resources has compelled the global intelligentsia to think over ways and means for the protection of environment. The environment is not a static system and subject to constant change but socio-economic pressure plays the major role in altering this system in a negative direction.

Tropical forest ecosystems are one of the richest terrestrial ecosystems which support a variety of life forms which maintain vast global biodiversity. The Government accords high priority to biodiversity conservation as described in

the approach paper to the Tenth Five Year Plan (2003-2007). The Wildlife Protection Act, 1972 provides legal protection to the species listed in its schedules I to IV. Habitat protection is also provided under the Forest Act, 1972, the Forest Conservation Act, 1980, the Environment Protection Act, 1980. Already in 1998 with the enunciation of National Forest Policy, the relationship between a balanced environment and the sustenance of all life forms, including humans has been described. Recently the National Forest Commission has been formed with the same aim. The National Wildlife Board (2002) has given priority to wildlife conservation.



*Ratufa bicolor (Beleramusa)*



As habitat protection, preserves the wildlife and biodiversity, hence biodiversity studies were conducted in 2010 & 2015 in the Preservation Plot to understand the change in bio-diversity to enable further planning in improving the management of sanctuary through habitat protection.

### STUDY AREA:

The study area lies in Kuldiha Wildlife Sanctuary which is connected to Similpal Biosphere Reserve of Mayurbhanj district through Sukhpada hills and Nato hill in the west. In the conservation history of the area the 4<sup>th</sup> January, 1984 was the turning point when state government constituted a



*Panthera Pardes (Cheeta Bagh)*

The bulk of the forests is having significant quantities of major species like sal (*Shorea robusta*), Asan (*Terminalia Tomentosa*), Bija (*Pterocarpus marsupium*), Dhaura (*Anoegissus latifolia*) and different medicinal shrubs and herbs. The forest type is mainly mixed deciduous in nature.

The area falls under tropical deciduous forest biome. The sanctuary area is adjacent to Nilgiri forest and Mayurbhanj forest which is typical representative of mixture of Peninsular (Coastal) Sal forest and moist mixed deciduous forest. The river Sono, a tributary of Budhabalanga flows in the western and northern portion of the forest.

According to the management plan of Kuldiha Wildlife Sanctuary, the forest types found inside the sanctuary area are:

- i. Northern semi-evergreen forest.
- ii. Peninsular (Coastal) Sal forest
- iii. Moist mixed deciduous forest

**AIMS AND OBJECTIVES:** The study has following major objectives:

- \* To prepare the sample plots in the preservation plots.
- \* To collect baseline data on floral diversity of Kuldiha Reserve Forest.
- \* To identify the plant species and their habitat.
- \* To prepare the herbarium and preserve these species.

**METHODS:** In the study of biodiversity assessment the survey was carried out by plot sampling. For this purpose the entire area of 100 Ha. was divided into 10 segments. In each segment a sample area of 400m<sup>2</sup> with length and breadth of 20m & 20m respectively were selected. All plants



above 3m tall were recorded by measuring girth at 1.37m. breast height (GBH) species wise. For bushes, shrubs (less than 3m tall) a sampling area of 25 m<sup>2</sup> (5m x 5m) was nested inside the aforementioned 100m<sup>2</sup> plot. The sampling plot of 1 m<sup>2</sup> (1m x 1m) area was also nested inside the 25m<sup>2</sup> plot to make inventory of all herbaceous vegetation. The plant species were identified with the help of "Flora of Odisha" (Saxena and Brahma, 1994-96).

The vegetation data were quantitatively analysed for abundance, density and frequency according to the formulae given by Curtis and McIntosh (1950) and Mishra (1968). The relative values were summed

up to represent Importance Value Index (IVI) as per Curtis (1959). The distribution pattern of species was studied using the ratio of abundance to frequency. Its value below 0.025 indicates regular distribution, between 0.025 – 0.050 indicates random distribution and when more than 0.050 indicates contagious distribution (Whitford 1949). The diversity index (H) was computed by using Shannon-Wiener information Index (Shannon and Wiener 1963). The concentration of dominance was computed by Simpson's Index (Simpson 1949). The dominance – diversity curves for trees, shrubs + saplings and herbs + seedlings were drawn on the basis of importance value index (IVI).



*Elephas maximus* (Hati)

For each sample plot of the vegetation, primary information has been collected, including local or scientific name and GBH plus height for all trees above 5 cm GBH.

The data was collected in the two sub-plots along with the local or scientific name of each existing flora species.



Secondary information has been taken for the complete sample plot including notifications on land cover, microhabitat, slope, aspect, terrain, soil depth, soil texture, anthropogenic pressure and general header information. They are acquired either via GPS or subject to gross estimation based on visual interpretation.

### **ABUNDANCE :**

With abundance being an expression of the species richness and diversity describing the number of species in an area, these

measures are appropriate in assessing the domination of a species in a set of species. Also communities with a high biodiversity show a low abundance in most of its members. In this study the role of a species in its community will be described by its relative abundance. The relative abundance is calculated via the sum of relative frequency and relative density. It is assumed that with this figure the importance of a species is sufficiently explained and can range between 0 and 200 %.

**Relative Frequency** = (Number of sample plots with a sighting of a species)/

(Total number of sample plots) x 100

**Relative Density** = (Density of the species) / ( Total density of all the species) x 100

**Relative Abundance** = Relative Frequency + Relative Density



*Bos gaurus (Gayal)*



## IMPORTANCE VALUE INDEX (IVI)

A measure often used to describe and compare the species dominance of the plots is the Importance Value Index of Cottam and Curtis (1956). The IVI for a species is calculated as the sum of its relative dominance, its relative frequency and its relative density. Certain points have to be acknowledged, to understand the

arguments the IVI is providing. Species occurring singular but with a high basal area may be given the same rank as widely spread but small species. Also some species may be dominant in one site but do not occur at other sites. Therefore their local dominance is not displayed in the overall statistics. Still, the IVI is giving a figure with the overall importance of a species.

**Relative Dominance** = (total basal area of a species) / Total basal area for all species ) x 100

**IVI** = Relative Frequency + Relative Dominance + Relative Density.

For non -timber species the importance value is called Relative Importance Value(**RVI**) and calculated as : Relative Frequency + Relative Density

## RESULTS AND DISCUSSION :

Main objectives of this study is to understand the study areas of forest to enable further planning in improving the management of sanctuary, thus creating or maintaining livelihood and conserve wildlife and biodiversity through habitat protection. With the help of remotely sensed data and verification via ground truthing the steps from quantitative to qualitative analysis are to be performed.

### DOMINANCE :

#### 1. Floristic Composition : -

Studies during 2010 reveal that there are 35 species in the over wood, 12 species in the middle storey and 13 species in the

ground flora representing 25 families of vascular plants. However, studies during 2015 shows increase in floristic composition with 38 species in the over wood, 38 species in the middle storey and 32 species in the ground flora representing 38 families of vascular plants.

#### 2. Tree Species : -

The upper storey during the studies on both the occasions shows, the tall trees with epiphytic growth of lichens bryophytes, ferns and orchids. Shorea robusta (Sal) is the dominant tree species in preservation plot having maximum relative density (20.75) and relative frequency (8.33) during studies of 2010.



The findings of 2015 are very interesting. Though *Shorea robusta* is common species in Similipal Forest but in preservation plot study it was shown that *Terminalia*

*tomentosa* is the dominant tree species having maximum relative density (23.256) and IVI for this species is highest (292.27)

#### 2010- Top five IVI of the tree species in the Kuldiha RF.

Species	IVI
<i>Shorea robusta</i>	72.75
<i>Terminalia tomentosa</i>	62.66
<i>Anogeissus latifolia</i>	27.20
<i>Cleistanthus collinus</i>	22.40
<i>Catunaregam spinosa</i>	20.00

#### 2015- Top five IVI of the tree species in the Kuldiha RF.

Species	IVI
<i>Terminalia tomentosa</i>	292.270
<i>Shorea robusta</i>	270.441
<i>Anogeissus latifolia</i>	199.937
<i>Bridelia retusa</i>	188.188
<i>Schleichera oleosa</i>	139.0572

### 3. Shrub:

As far as shrub is concerned the highest value of IVI (114.42) was recorded for *Shorea robusta* in both the year of study whereas lowest IVI (0.86) for *Polyalthia cerasoides* during 2010 and lowest IVI (1.358) for species of *Aegle marmelos*. In the herb layer the most dominant species was *Hemidesmus indicus* of RVI (77.30) followed by *Ichnocarpus frutescens* (18.45).

In 2015 studies of shrub layer the highest RVI (50.89) was recorded for *Shorea robusta* whereas lowest (RVI-1.358) for the species *Aegle marmelos*, *Adina cordifolia*. In the herb layer the most dominant species was *Croton roxburghii* of RVI (17.11) followed by *Shorea robusta* (15.91).

### 4. Medicinal Plant: -

A large number of potential medicinal plant species were found in the preservation plot during both the years of studies. These are



depleting rapidly because of unsustainable harvesting, lack of awareness and unrestricted grazing by domestic animals from nearby villages. Major medicinal plant species such as *Asparagus recemosus*, *Costus speciosus* and *Curculigo orchioides* were harvested

in bulk for preparation of medicines by the local people. Unsustainable collection of these medicinal plants has placed them in threatened and vulnerable categories in Conservation Assessment and Management Plan (CAMP) of Odisha. (Reddy and Pattanaik, 2009).



*Hystrix indica (Jhinka)*

#### **Floral analysis: -**

In 2010 studies, 35 tree species, 12 shrubs and 13 herbs of 25 different families have been reported with Euphorbiaceae, Rubiaceae, and Combretaceae being the most existing. The Family with the most species present in the study area is Euphorbiaceae, followed by Rubiaceae and Combretaceae.

In 2015 studies, 38 tree species, 38 shrubs and 32 herbs of 38 different families have been reported with Euphorbiaceae, Rubiaceae and Combretaceae being the most existing. The Family with the most species present in the study area is Euphorbiaceae, followed by Rubiaceae and Combretaceae. **(Annexure on Trees, shrubs & climbers)**

#### **Population Structure: -**

Highest number of individuals was found in studies during 2010. It is also revealed that the number of individuals drastically declined & became half of the matured tree in the >100cm GBH. Hence protection is needed to preserve these highest GBH trees. All the trees were taken into consideration. Studies during 2015 revealed that between 51-100cm there were 90 species whereas >200cm only 2 species like *Madhuca indica* & *Dillenia pentagyna* were recorded. It was also revealed that 36 number of individuals matured in the >100cm GBH out of total 38 tree species recorded in the 10 plots which shows 100% adult matured good class tree with good diversity value. So the protection is needed to preserve these highest GBH trees.

Regeneration status of the forest was good. However their further development is prevented by the various human activities. Fire protection and protection from cattle is needed for evolving seedling to sapling & sapling to established stage.



**Girth Class-2010**

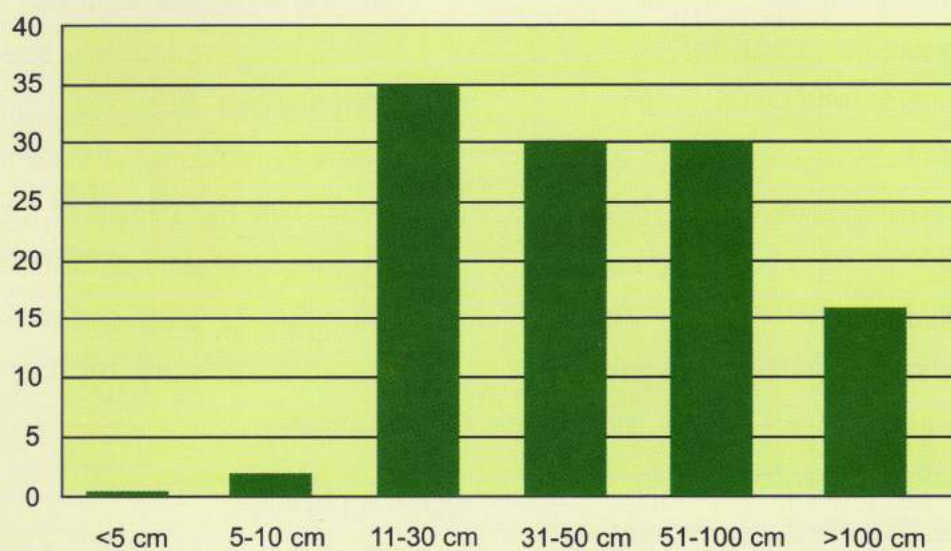
ID	GBH (cm)	No of individuals	%
1	<5	0	0
2	5-10	5	1.25
3	11-30	135	34.0
4	31-50	98	24.68
5	51-100	100	25.18
6	>100	49	12.34

**Girth Class-2015**

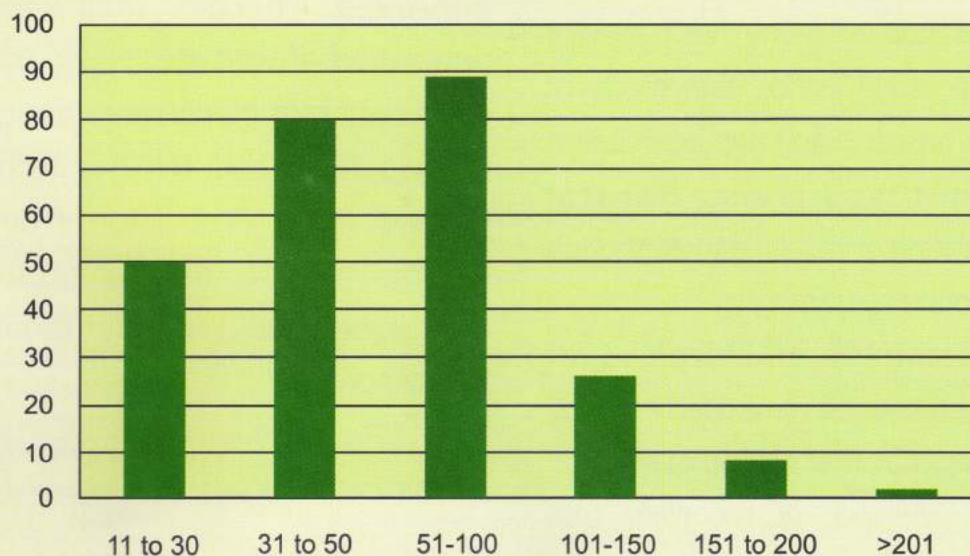
ID	GBH (cm)	No of individuals	%
1	<30	53	20.075
2	30-50	82	31.060
3	51-100	90	34.090
4	101-150	29	10.984
5	151-200	8	3.030
6	>200	2	0.757



**Girth Class – 2010**



**Girth Class- 2015**





## **Findings**

1. The forest cover of the area has improved in comparison with last five years so as to provide proper habitat for the wild animals.
2. In many sample plots the evidences of animal like wild boar, porcupine, dung of elephant, pellets of barking deer were collected which indicates the indirect evidence of their increase in population.
3. The number of nests and sighting of giant squirrel were found more in Terminalia tomentosa tree, which indicates that the upper canopy of the plant is dense.
4. The shrub species including sal, putuli, putua, kuluchi, and kasi were found abundant in most study plots.
5. Regeneration of many herb species were recorded, since the seeds of Bridelia retusa (kasi) has been eaten by giant squirrels. Natural regeneration of kasi is marked though kasi is found sporadically.
6. Large amount of rhizomes of Dioscorea species were used more by wild boar and other wild animals.
7. Out of 258 no. of recorded tree species 36 numbers of trees were found more than 100cm GBH, which indicates the healthy ecosystem of forest.
8. In this sanctuary, good sal natural regeneration was recorded. To ensure progression to moist sal forests, strict protection from fuel wood collection, grazing and fire is required.
9. Inside the sanctuary species like Paminagium ulgolosa (local name Tolunka) is found in swampy areas. This fruit is suitable for human consumption as learnt from tribals. This fruit is also preferred by the elephants staying inside the sanctuary.

## **CONCLUSION:**

The major goal of the study had been to estimate the IVI value of the major timber species of the preservation plots. The condition of habitat had been improved, thereby increasing the population of wild life. Major source of degradation of biodiversity are grazing, lopping, fuel wood, NTFP collection and ground fires. Protection from illicit felling, grazing and environmental awareness are sincerely required in future actions.



## ANNEXURE

**Distribution of plant diversity in Kuldiha preservation plots, trees (Over wood)**

Sl. No.	TREES		
	Family	Botanical Name	Local Name
1.	Anacardiaceae	Buchanania lanzan	Char
2.	Annonaceae	Polyalthia cerasoides	Gandhasal
3.	Annonaceae	Millusa velutina	Parashi
4.	Apocynaceae	Holarrhena antydysenterica	Kuluchi
5.	Bignoniaceae	Oroxylum indicum	Phanphena (danguapan)
6.	Burseraceae	Protium serratum	Rimuli
7.	Cesalpiniaceae	Cassia fistula	Sunari
8.	Combretaceae	Terminalia tomentosa	Asana
9.	Combretaceae	Terminalia bellerica	Bahada
10.	Combretaceae	Anogeissus latifolia	Dhaura
11.	Combretaceae	Terminalia chebula	Harida
12.	Dilleniaceae	Dillenia pentagyna	Rai
13.	Dipterocarpaceae	Shorea robusta	Sal
14.	Ebenaceae	Diospyros melanoxylon	Kendu
15.	Ebenaceae	Diospyros malabarica	Kal kendu
16.	Euphorbiaceae	Bridellia retusa	Kashi
17.	Euphorbiaceae	Antidesma gharsembilla	Matha saga
18.	Euphorbiaceae	Croton roxburghii	Putuli
19.	Fabaceae	Xylia xylocarpa	Kongada
20.	Fabaceae	Butea parviflora	Palasha
21.	Fabaceae	Pterocarpus marsupium	Piasal
22.	Fabaceae	Dalbergia sisso	Sisso
23.	Flacourtiaceae	Casearia elliptica	Khakada
24.	Lecythidaceae	Careya arborea	Kumbhi
25.	Rutaceae	Aegle marmelos	Bela
26.	Lythraceae	Largerstroemia parviflora	Sidha
27.	Meliaceae	Antidesma acidum	Nunannunia
28.	Meliaceae	Soymida febrifuga	Rohini
29.	Mimosaceae	Albizia lebbek	Sirisa
30.	Myrtaceae	Syzygium cumini	Jamu
31.	Papilionoideae	Dalbergia latifolia	Pahadia sisso
32.	Phyllanthaceae	Emblica officinalis	Aonla
33.	Rhamnaceae	Ziziphus oenoplia	Borakoli
34.	Rhamnaceae	Zizyphus mauritiana	Barkoli
35.	Rubiaceae	Mitragyna parvifolia	Godikoima
36.	Rubiaceae	Randia dumetorum	Patua
37.	Rubiaceae	Haldinia cordifolia	Kurma
38.	Sapindaceae	Schleichera oleosa	Kusuma
39.	Sapotaceae	Madhuca indica	Mahula
40.	Sterculiaceae	Pterospermum acerifolium	Giringa



Sl. No.	SHRUBS & CLIMBERS		
	Family	Botanical Name	Local Name
1	Asteraceae	Ageratum conyzoides	Dahanimari
2	Caesalpiniaceae	Bauhinia vahlii	Siali
3	Combretaceae	Combretum roxburghii	Atundi
4	Cycadaceae	Cycas circinalis	Veru
5	Euphorbiaceae	Mallotus philippensis	Kamalagundi
6	Fabaceae	Flemingia chappar	Rani dant kathi
7	Fabaceae	Butea superba Roxb	Noi palaso
8	Flacourtiaceae	Flacourtia jangomas	Boinchakoli
9	Mimosaceae	Acacia pennata	Dantari
10	Mimosaceae	Mimosa himalayana	Khirkichikanta
11	Oleaceae	Nyctanthes arbor-tristis	Gangasiuli
12	Phyllanthaceae	Cleistanthus collinus	Koarada
13	Rhamnaceae	Zyzyphus xylopyrus	Barokoli
14	Rubiaceae	Gardenia gummifera	Bhurudu
15	Smilacaceae	Smilax zeylanica	Mutri
16	Sterculiaceae	Helicteres isora	Modimudica
17	Verbenaceae	Clerodendrum viscosum	Gobra
18	Verbenaceae	Lantana camara	Putush





*Vulpes bengalensis* (Kokisiali)



*Pavo cristatus* (Mayura)





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